

REMARKS

The Examiner is thanked for the thorough examination of the application. The specification has been amended to correct minor errors and to insert priority information. No new matter is believed to be added to the application by this Amendment.

Status Of The Claims

Claims 1-3, 5-18, 20-28 and 30-39 are pending in the application. Claims 1, 7, 8, 12, 13, 16, 17, 22, 23, 27, 34, 36 and 37 are independent. Claims 27-33 have been withdrawn from consideration. Allowable claims 7, 8, 12, 16, 17, 22, 23, 36 and 37 have been amended to stand as independent claims, including the subject matter of any intervening claims. Claims 4, 19 and 29 have been cancelled and their subject matter has been incorporated into claims 1, 13 and 27, respectively. Independent claim 34 has been amended similar to claims 1, 13 and 27. Claims 12, 15 and 34 have also been amended to improve the language.

Objection To Claim 34

The Examiner objects to claim 34 as containing an informality. Claim 34 has been amended to be free from informalities.

Rejection Under 35 U.S.C. §112, Second Paragraph

Claims 12 and 15 are rejected under 35 U.S.C. §112, second paragraph as being indefinite. Applicant traverses.

At pages 2 and 3 of the Office Action, the Examiner asserts that claims 12 and 15 have insufficient antecedent basis. Claims 12 and 15 have been amended to be clear, definite and have full antecedent basis.

This rejection is overcome and withdrawal thereof is respectfully requested.

Rejections Under 35 U.S.C. §103(a) Based On Nagahama

The Examiner applies the following rejections to the present invention:

1. Claims 1 and 5 are rejected under 35 U.S.C. §103(a) as being obvious over Nagahama (U.S. Patent 6,849,864) in view of Yamada (U.S. Patent 6,608,330) and Emerson (U.S. Patent 6,958,497).

2. Claims 2 and 11 are rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Yamada and Emerson as applied to claim 1 and further in view of Lee (U.S. Patent 6,720,570).

3. Claim 3 is rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Yamada and Emerson as applied to claim 1 and further in view of Tanizawa (U.S. Patent 6,657,234).

4. Claim 4 is rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Yamada and Emerson as applied to claim 1 and further in view of Koike (U.S. Patent 6,830,948).

5. Claims 6, 9 and 10 are is rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Yamada and Emerson as applied to claim 1 and further in view of Sverdlov (U.S. Patent 6,266,355).

6. Claims 13, 15, 19 and 20 are rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Koike.

7. Claim 14 is rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Koike as applied to claim 13 and further in view of Lee.

8. Claim 26 is rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Koike and Lee and further in view of Emerson.

9. Claim 18 is rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Koike as applied to claim 13 and further in view of Tanizawa.

10. Claims 21, 24 and 25 are rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Koike as applied to claim 13 and further in view of Sverdlov.

11. Claims 34, 38 and 39 are rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Sverdlov.

12. Claims 38 and 39 are rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Koike and Sverdlov.

13. Claim 35 is rejected under 35 U.S.C. §103(a) as being obvious over Nagahama in view of Sverdlov as applied to claim 34 and further in view of Lee.

Applicant traverses all of the aforesaid rejections and respectfully requests reconsideration and withdrawal thereof for the reasons set forth below.

The Present Invention And Its Advantages

The present invention pertains to a novel light emitting device that restrains crystal defects arising from the mismatch of thermal expansion. The advantages of the invention, in part, are obtained by utilizing a Si/In codoped GaN layer as a first electrode contact layer to thereby further restrain crystal defects.

The present invention has many embodiments, and a typical embodiment can be found in claim 1:

1. A nitride based 3-5 group compound semiconductor light emitting device comprising:
 - a substrate;
 - a buffer layer formed above the substrate;
 - a first In-doped GaN layer formed above the buffer layer;
 - an $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{In}_y\text{Ga}_{1-y}\text{N}$ super lattice structure layer formed above the first In-doped GaN layer;
 - a first electrode contact layer formed above the $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{In}_y\text{Ga}_{1-y}\text{N}$ super lattice structure layer, the first electrode contact layer comprising a Si/In-codoped GaN layer;
 - an active layer formed above the first electrode contact layer and functioning to emit light;
 - a second In-doped GaN layer;
 - a GaN layer formed above the second In-doped GaN layer; and
 - a second electrode contact layer formed above the GaN layer.

Distinctions Of The Invention Over The Applied Art

Nagahama pertains to a semiconductor light emitting device that includes an auxiliary substrate 301, a nitride semiconductor substrate 304, a first In-doped GaN layer 312, a superlattice structure 313, a first electrode contact layer 311, an active layer 315, a p-type light waveguide layer 317, a GaN layer 319 and a second electrode contact layer 320.

In the Office Action, the Examiner unequivocally admits to many of the failures of Nagahama, including:

1. The failure to teach that the first electrode contacting layer is formed above the superlattice structure.
2. The failure to teach an $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{In}_y\text{Ga}_{1-y}\text{N}$ superlattice structure layer.
3. The failure to teach that the second electrode contact layer is n-type.
4. The failure to teach that the buffer layer is selected from an InGaN/GaN super lattice structure, an $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$ structure or an $\text{Al}_x\text{In}_y\text{Ga}_{1-x-y}\text{N}/\text{In}_x\text{Ga}_{1-x}\text{N}/\text{GaN}$ structure.
5. The failure to teach that the first electrode contact layer comprises an Si/In codoped GaN layer.
6. The failure to teach that the quantum well structure includes a low mole In-doped $\text{In}_x\text{Ga}_{1-x}\text{N}$ layer, an $\text{In}_y\text{Ga}_{1-y}\text{N}$ well layer and an $\text{In}_z\text{Ga}_{1-z}\text{N}$ barrier layer.
7. The failure to teach that the first electrode contact layer is formed above the first In-doped GaN layer.

In order to address the deficiencies of Nagahama, the Examiner turns to the teachings of Yamada, Emerson, Lee, Tanizawa, Sverdlov and Koike.

Typically, the Examiner asserts in the Office Action at page 9, lines 6-9:

Koike teaches from fig. 2, a first electrode contact layer comprising a Si/In-codoped GaN layer (103). Layer 103 is an underlying layer which encompasses a GaN layer and silicon doped n-GaN (see column, 11, lines 50-55). From column 16, lines 1-3, Koike teaches that this underlying layer may be doped with indium as well.

However, Koike at column 11, lines 50-55 states:

Notably, in formation of the GaN layer 32, silane (SiH_4) was introduced so as to form a silicon (Si)-doped n-type GaN layer serving as the GaN layer 33. For the sake of simplified illustration, the drawing merely illustrates a GaN layer 103 including the mask 4 to inclusively represent the GaN layer 31 and the GaN layer 32.

Further, Koike at column 16, lines 1-3 states: "Alternatively, indium (In) may be doped in the underlying layer in all the embodiments in order to improve crystallinity of the underlying layer."

That is, although Koike may teach that indium may be doped as an **alternative**, nowhere does Koike teach or suggest a Si/In **codoped** layer, as is posited by the Examiner. The other applied art references fail to address this deficiency of Koike. As a result, one of ordinary skill in the art would not be motivated by any combination of the applied art references to produce the invention of claims 1, 13, 27 or 34, which recite a Si/In codoped layer. A *prima facie* case of obviousness has thus not been made. Claims depending upon claims 1, 13, 27 or 34 are patentable for at least the above reasons.

Further, the Examiner combines and recombines the applied art references to generate thirteen rejections. This plethora of rejections can only be achieved by impermissible hindsight reconstruction.

"Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is a rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references." *In re Dembiczak*, 50 USPQ2d 1614, 1617 (CAFC 1999). See also *In re Kotzab*, 55 USPQ2d 1313, 1316 (CAFC 2000). "Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing

together the prior art to defeat patentability--the essence of hindsight." *Dembiczak* at 1617. "The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time." *Dembiczak* at 1617. "The patent examination process centers on prior art and the examination thereof. When patentability turns on the question of obviousness, the search for and analysis of the prior art includes evidence relevant to the finding of whether there is a teaching, motivation, or suggestion to select and combine the references riled on as evidence of obviousness . . . The factual inquiry must be thorough and searching. It must be based on objective evidence of record." *In re Sang-Su Lee*, 277 F.3d 1342, 1343 (Fed. Cir. 2002).

A *prima facie* case has thus not been made for these additional reasons.

These rejections are overcome and withdrawal thereof is respectfully requested.

Information Disclosure Statement

The Examiner is thanked for considering the Information Disclosure Statement filed December, 2004 and for making the initialed PTO/SB/08 form of record in the application in the Office Action mailed December 14, 2005.

Prior Art

The prior art cited but not utilized by the Examiner indicates the status of the conventional art that the invention supersedes. Additional remarks are accordingly not necessary.

Foreign Priority

The Examiner has acknowledged foreign priority in the Office Action mailed December 14, 2005.

Conclusion


The Examiner's objection and rejections have been overcome, mooted or obviated. No issues remain. The Examiner is respectfully requested to place the application in condition for allowance and to issue a Notice of Allowability.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D. (Reg. No. 42,593) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

By  _____

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